

[0076] FIGS. 18a and 18b are top and bottom isometric views, respectively, depicting the fluidic network in accordance with the schematic representation of FIG. 14a.

[0077] FIG. 19 is a bottom view of the upper cartridge component of the assay cartridge depicted in FIG. 14b illustrating one embodiment of integral filters.

[0078] FIG. 20 is a bottom isometric view of an alternative assay cartridge embodiment illustrating filter inserts.

[0079] FIG. 21 is an isometric view of the assay cartridge depicted in FIG. 14b having assay reagent ampoules inserted therein, illustrating one embodiment for an assay reagent release mechanism.

[0080] FIG. 22 illustrates one embodiment for a drop-in assay reagent blister pack assembly and integrated assay reagent release (piercing) mechanism.

[0081] FIG. 24 illustrates one preferred valve configuration for the assay cartridge depicted in FIG. 14a.

[0082] FIG. 25 is the schematic representation shown in FIG. 14a depicting the arrangement of fluidic components and locations of fluid detectors.

[0083] FIGS. 26a through 26c illustrate one preferred manner of operating the assay cartridge depicted in FIG. 25.

[0084] FIG. 27 is a cross-sectional view of a sample chamber having an integral vent port within the chamber itself.

[0085] FIG. 28 is a cross-sectional view of one embodiment of a sample chamber for extracting analyte from a solid or solid-containing matrix.

[0086] FIG. 29 is a cross-section view of an alternative embodiment of a sample chamber for extracting analyte from a solid or solid-containing matrix incorporating force focusing elements.

[0087] FIG. 30 is a cross-section view of another embodiment of a sample chamber for extracting analyte from a solid or solid-containing matrix incorporating a two-region, or compound, sample chamber.

[0088] FIG. 31 is a cross-sectional view depicting one embodiment of a bubble trap chamber.

[0089] FIG. 32 is a schematic representation of another embodiment of an assay cartridge illustrating various fluidic components.

[0090] FIG. 33 is an exploded assembly drawing illustrating the laminar assemblage for a two-piece, extraction assay cartridge in accordance with the schematic diagram given in FIG. 32.

[0091] FIG. 34 depicts a cutaway exploded view of one preferred design for a cartridge reader.

DETAILED DESCRIPTION

[0092] The invention, as well as additional objects, features and advantages thereof, will be understood more fully from the following detailed description of certain preferred embodiments. Where the terms “measure” or “measurement” are used herein, they are understood to encompass quantitative and qualitative measurement, and encompasses measurements carried out for a variety of purposes includ-

ing, but not limited to, detecting the presence of a thing or property, measuring the amount of a thing or property, and/or identifying a thing or property in a sample

[0093] The present invention includes apparatuses, electrodes, electrode arrays, systems, system components, kits, reagents and methods for performing one or more assays on a sample. The invention includes assay modules (e.g., assay cartridges, assay plates, etc.) having one or more assay cells (e.g., wells, compartments, chambers, conduits, flow cells, etc.) that may comprise one or more assay domains (e.g., discrete locations on a assay cell surface where an assay reaction occurs and/or where an assay dependent signal, such as an electrochemical or preferably an electrode induced luminescence signal is induced) for carrying out a plurality of assay measurements.

[0094] In certain preferred embodiments, assay domains are supported on assay electrodes (preferably, an array of assay electrodes, most preferably a one dimensional array of assay electrodes) so as to permit the conduct of assays based on electrochemical or electrode induced luminescence measurements. The assay domains are, optionally, defined by a dielectric layer deposited on the electrodes. The assay modules, preferably, have one or more attributes that make them suitable for use in “point of care” clinical measurements, e.g., small size, low cost, disposability, multiplexed detection, ease of use, etc. The methods and apparatuses of the invention, allow these benefits to be achieved while maintaining the performance of traditional batch processing instruments of the type typically used in the central clinical lab.

[0095] The assay module may comprise the necessary electronic components and/or active mechanical components for carrying out an assay measurement, e.g., one or more sources of electrical energy, ammeters, potentiometers, light detectors, temperature monitors or controllers, pumps, valves, etc. Preferably, some or all of the electronic and/or active mechanical components are arranged within a separate assay module reader. The reader would also have the appropriate electrical, fluidic and/or optical connections to the assay module for carrying out an assay on the assay module. Using such an arrangement, the assay module can be designed to be low cost and disposable while the reader (which holds the more expensive and complex components) is reusable. A preferred assay procedure using an assay module and assay reader would comprise inserting the cartridge in the reader, making the appropriate electrical, fluidic and/or optical connections to the cartridge (making use of electrical, fluidic and/or optical connectors on the cartridge and reader), and conducting an assay in the cartridge. The sample is preferably introduced into the cartridge prior to inserting the cartridge in the reader. The assay may also involve adding one or more assay reagents to the cartridge; preferably, one or more assay reagents are stored in the cartridge in a dry and/or wet form.

[0096] The invention also includes methods of preparing the assay modules including methods for preparing electrode arrays and forming assay domains on these electrode arrays. The invention also includes methods for washing assay domains to remove unbound reagents without allowing these reagents to interact with other surfaces in the assay module.

[0097] One preferred embodiment of the invention comprises an assay cartridge comprising one or more assay flow